

(12) UK Patent Application (19) GB (11) 2 006 836 A

(21) Application No 7838229
(22) Date of filing 26 Sep 1978
(23) Claims filed 26 Sep 1978
(30) Priority data
(31) 185256
(32) 26 Sep 1977
(31) 186839
(32) 31 May 1979
(51) INT CL²

(54) Spin Drying Clothes Washing Machine

(57) A bowl or tub for a spin drying washing machine comprises a hub (1), a plurality of arms (4) radiating from the hub (1), an annular plastics liner (5) mounted on the arms (4) and a

annular passageway (37) is located at the upper edge of the cylinder (6) and is partially filled with a foamed plastics material and partially filled with brine. At the running speed of the spin dryer the brine is disposed so as to tend to reduce imbalance of the bowl. A lip (13) of an agitator (14) fits the ing

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ERRATUM

SPECIFICATION No. 2 006 836 A
Slip No. 2

(58)

Front Page, Heading (32) (second occurrence) *delete* 31 May 1979 *insert* 31 Mar 1978

(71)

THE PATENT OFFICE
9th January, 1981

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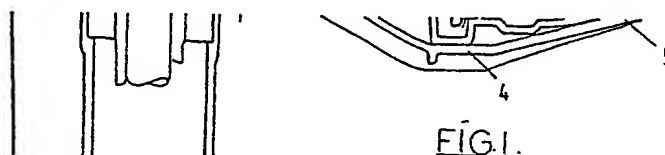
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SPECIFICATION No. 2 006 836 A

Front page *below* heading (32) (second occurrence) *insert* (33) New Zealand (NZ) (43) Application published 10 May 1979

THE PATENT OFFICE
19th September, 1980

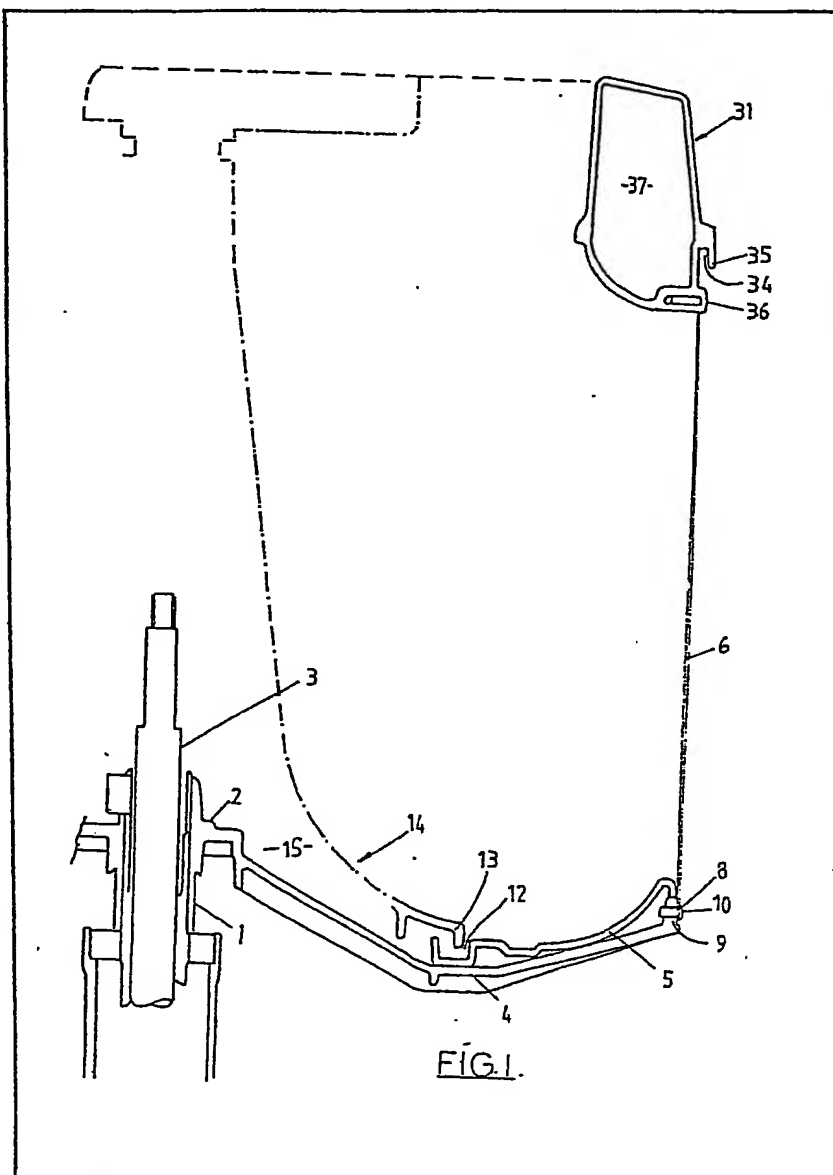


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 D06F 37/02
 (52) Domestic classification
 D1A B2 D6 E1 E2A E6B EB
 E9A E9B F1B F5B1 H4 K1
 L1D1A
 (56) Documents cited
 GB 918130
 GB 792128
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 (58) Field of search
 D1A
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(54) Spin Drying Clothes Washing Machine

(57) A bowl or tub for a spin drying washing machine comprises a hub (1), a plurality of arms (4) radiating from the hub (1), an annular plastics liner (5) mounted on the arms (4) and a perforated cylinder (6) having a lower edge encircling the liner (5) and fixed to the arms (4) by rivets (10). An

annular passageway (37) is located at the upper edge of the cylinder (6) and is partially filled with a foamed plastics material and partially filled with brine. At the running speed of the spin dryer the brine is disposed so as to tend to reduce imbalance of the bowl. A lip (13) of an agitator (14) fits into an annular channel (12) of the liner (5) to prevent articles moving into a space (15).



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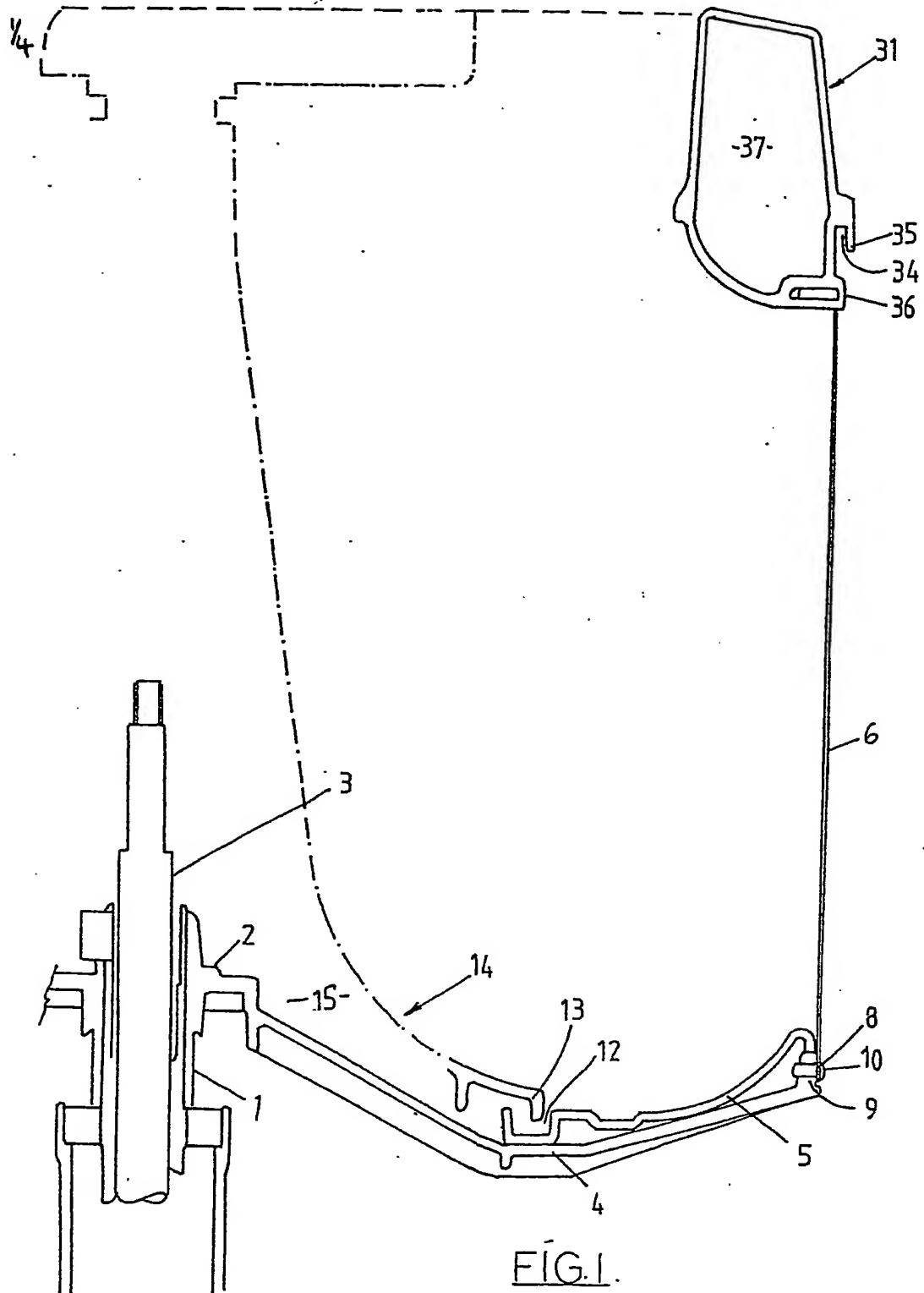


FIG 3

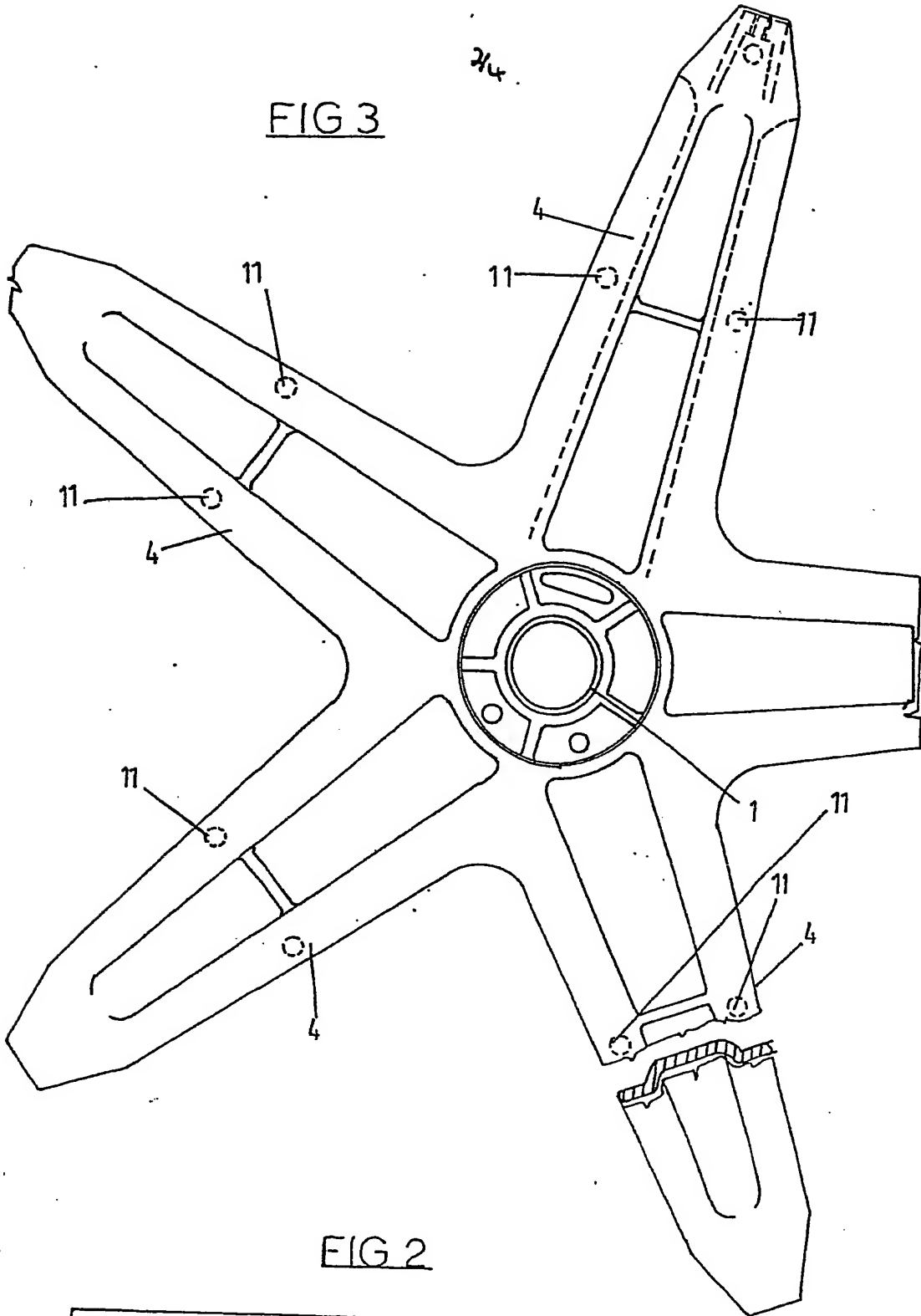


FIG 2

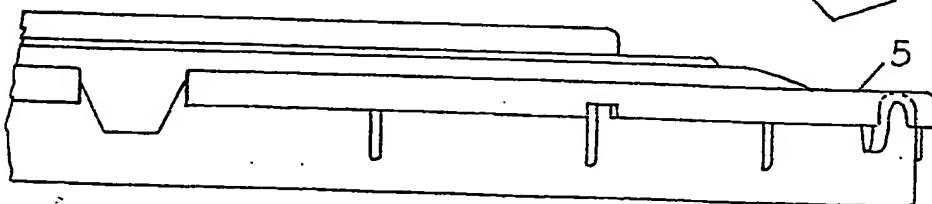
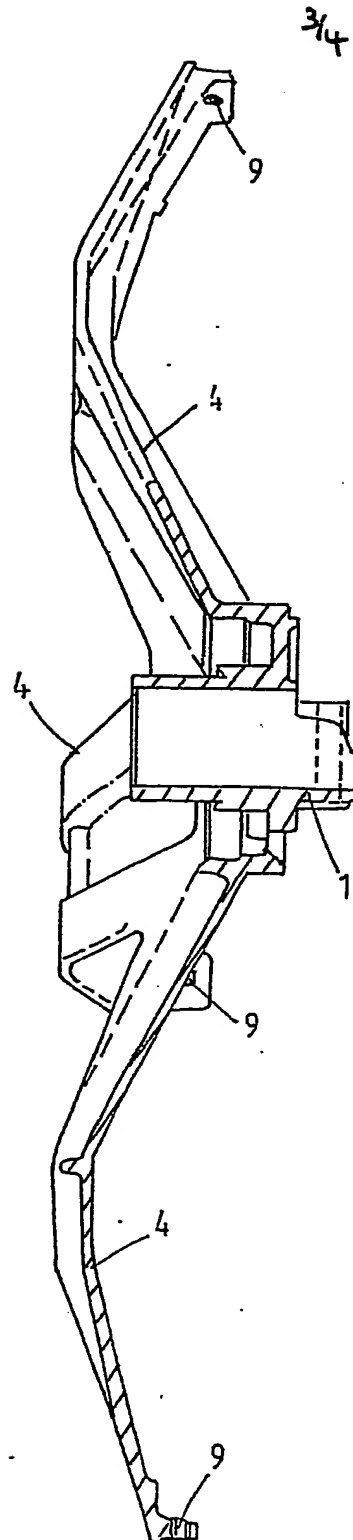
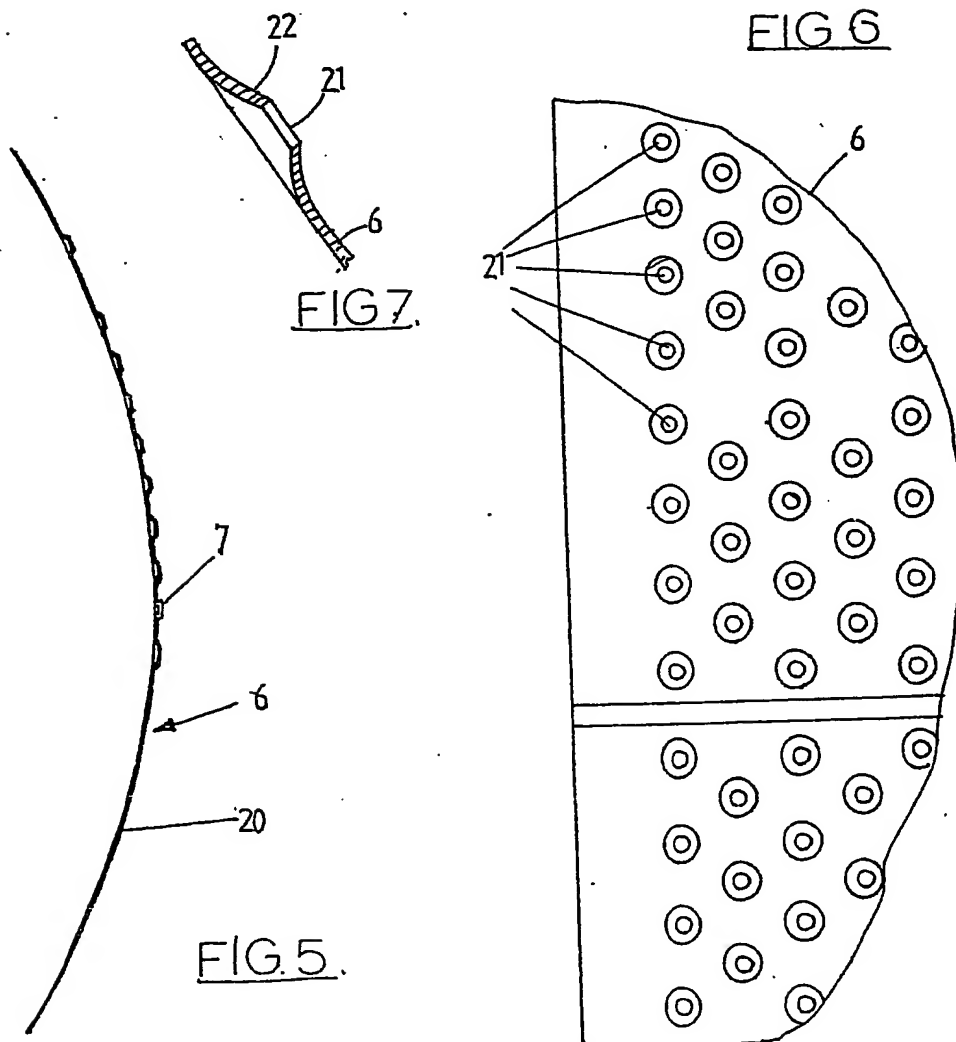
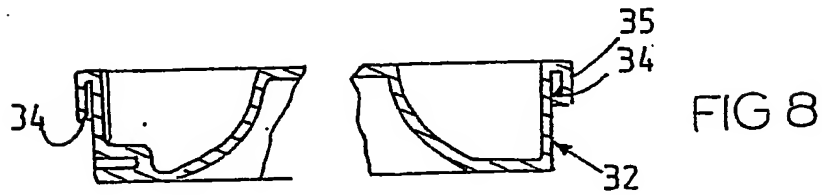
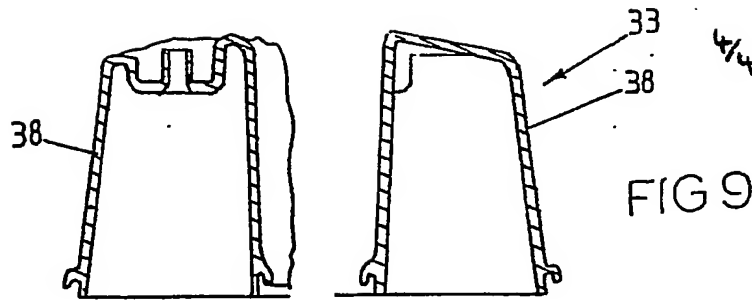


FIG 4



SPECIFICATION

Improvements in or Relating to Bowls or Tubs

This invention relates to bowls or tubs and has been devised particularly though not solely for spin drying clothes washing machines or the like.

It is an object of the present invention to provide a bowl or tub which will provide the public with a useful choice.

Accordingly in one aspect the invention consists in a rotatable bowl or tub for spin drying clothes washing machine or the like comprising a hub, a plurality of arms or spokes radiating from said hub, a cylindrical or substantially cylindrical outer member; mounting means whereby said outer member is fixed to said arms or spokes and a liner, for example, of a plastics material mounted within said outer member and supported by said outer member and said arms or spokes.

In a further aspect the invention consists in a method of reducing imbalance in a rotatable resiliently mounted bowl or tub for spin drying clothes washing machine or the like said method using a resiliently mounted bowl having an annular passageway concentric with the axis on which the body is rotating, said hollow concentric body having a plurality of interconnected cells therein and said passageway being partially filled with a liquid, said method comprising the steps of rotating said body at a speed above its critical speed and permitting interchange of liquid between said interconnected cells in a manner such that imbalance of the rotating body is reduced by displacement of the liquid to positions which tend to counteract the imbalance produced by the positions of other weights in the rotating body.

In a further aspect the invention consists in means for reducing imbalance in a rotatable resiliently mounted bowl or tub for a spin drying clothes washing machine or the like said means comprising an annular passageway mounted on the bowl in use substantially concentric with the axis on which the bowl rotates said hollow annular passageway having a plurality of interconnected cells therein and being partially filled with a liquid, the construction and arrangement being such that in use on mounting said means on a resiliently mounted bowl or tub for a spin drying clothes washing machine or the like containing weights which are unbalanced said liquid is caused by the forces resulting from rotation of the bowl above its critical speed to take up positions which reduce the imbalance due to the aforesaid unbalanced weights.

To those skilled in the art to which this invention relates many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the scope of the invention as defined in the appended claims. The disclosures and the description herein are purely illustrative and are not intended to be in any sense limiting.

One preferred form of the invention will now be described with reference to the accompanying drawings in which,

Fig. 1 is a diagrammatic part cross section of a spin drying clothes washing machine bowl incorporating the invention,

Fig. 2 is a part elevation of a line mounted in the bowl of Fig. 1,

Figs. 3 and 4 are plan and side views respectively of a spider forming part of the bowl shown in Fig. 1,

Fig. 5 is a part plan view of an outer cylindrical part of the bowl shown in Fig. 1,

Fig. 6 is a part elevation of the cylindrical part of Fig. 5,

Fig. 7 is an enlarged view of a section of an apertured part of the wall of the cylindrical part shown in Figs. 5 and 6, and

Figs. 8 and 9 are cross sections of base, lid or top parts respectively of a balance ring for mounting in the bowl of Fig. 1.

Referring to the drawings in the preferred form of the invention a bowl of a spin drying clothes washing machine is provided as follows. The bowl is resiliently mounted and a hub 1 is made, for example, as a casting or forging and the hub has a central member with e.g. an aperture 2 for fixing the hub 1 to a shaft 3 which is driven with a suitable motion by any known transmission from e.g. electric motor. The hub is resiliently mounted as in present spin drying agitator type clothes washers such as the Fisher & Paykel type 400. The hub is integral with a spider provided with a series of arms or spokes 4 and for example, five or seven arms are provided.

An inner liner 5 is provided (Figs. 1 and 2) preferably as an injection moulding from a plastics material and the liner is mounted within an outer member 6 and supported by the outer member and the spokes or arms in any suitable manner.

The outer member 6 is provided comprising for example, a sheet of metal such as stainless steel formed to a cylindrical or substantially cylindrical form, for example, a frustum of a cone having sides which change in diameter in cross section by only a small amount. The sheet of stainless steel has the ends thereof joined to each other by welding by a lock seam 7 (Fig. 5) or otherwise as desired. One end of the outer member has parts of mounting means, for example, apertures 8 therein and the free ends of the spokes or arms have corresponding apertures 9 and fastening means have parts thereof passing through the apertures, the ends of the fastening means being suitably formed e.g. by rivet 10 or providing threaded members thereon so that the outer member is fixed to the spokes or arms.

Referring to Figs. 5 to 7 the wall 20 of the outer member 6 is perforated the pattern of perforations 21 being shown in Fig. 6 and the shape of the perforations in Fig. 7 from which it can be seen that the perforations 21 surmount an outwardly extending dimple 22.

The inner liner 5 is also fixed to the spokes 4 by

rivets (not shown) through holes 11 in the spokes 4 and corresponding holes in the liner. The liner 5 has an annular channel 12 into which a lip 13 of an agitator 14 fits to inhibit or prevent articles being washed moving into the space 15 between the spokes 4 and the agitator 14.

Referring to Figs. 1, 8 and 9 a means for reducing imbalance in the bowl is provided as follows.

The bowl 6 is shown as being the bowl of a spin drying clothes washing machine but of course the invention is also applicable to a separate spin dryer. Accordingly a hollow annular member 31 is provided of a suitable diameter and the member 31 may have a cross section as shown in which the hollow annular member 31 is made of two dissimilar mouldings comprising a base member 32 and a lid 33, a slot 34 being provided by flange 35, the outer member 6 fitting in the slot 34 as may be seen in Fig. 1. Alternative ring shapes may be provided e.g. by using two symmetrical halves but the illustrated construction is preferable since it keeps the weight lower down on the bowl. However the symmetrical arrangement is cheaper to manufacture since only a single mould is required to produce the two parts and the choice is largely one of economics.

An adhesive or screws or rivets 36 are used to fasten the upper edge of the outer member 6 in the slot 34. The members 33 and 34 are joined to each other by any suitable means, for example, by an adhesive by a solvent if the moulding is of a plastics material or vibration or hot plate welding may be used for suitable plastics material. The hollow interior 37 of the hollow annular member is filled or at least partially filled with a material providing a great number of interconnected open cells and to this end the hollow interior 37 is filled or partially filled with a suitable foamed plastics material. We have found that an open cell polyester material such as Polyurethane foam having e.g. 30—70 pores per inch is adequate. The hollow interior 37 is then partially filled, for example, 60% of the volume is filled with a suitable liquid filling, for example, a brine filling, the salt being added to increase the specific gravity of the liquid used to some extent and also to inhibit unwanted growths in the liquid. Of course other liquid could be used including, for example, a very heavy liquid such as mercury but having regard to cost it has been found that the brine filling is an adequate liquid filling.

A plurality of coaxial balance rings having substantially the same radii may be provided preferably spaced apart from each other or from one another e.g. one near the top of the bowl as above described and another near the bottom of the bowl. Intermediate rings could be positioned spaced between such top and bottom rings. A plurality of rings aids balancing or production techniques in certain constructions.

Balancing rings could also be placed in substantially the same plane disposed with the outer diameter of one adjacent the inner diameter

of the next. Tapering of the outer face 38 may also improve performance for a given amount of fluid e.g. by tapering the outer face 38 upwardly inwardly as shown.

The use of the balance ring construction is as follows:

After the clothes washing machine has been operated to wash clothes in accordance with present practice the water is then drained from the bowl and the driving mechanism of the bowl is arranged to rotate the bowl at high speed. The clothes in the bowl are usually positioned in a random manner resulting in the weight of the clothes causing imbalance of the rotating body comprising the bowl and the contained clothes. As a result of forces acting on the liquid in the annular passageway of the member 1 the liquid 7 tends to pass through the interconnecting passageways in the cells in the foamed material 8 to take up positions which reduce the imbalance caused by the unbalanced weight of clothes in the bowl. As a result the rotating body tends to reach a more balanced state while rotating than is possible without the annular passageway operating in the above manner.

It is believed that the theory of operation is as follows:

As the spinning system increases speed it passes through a resonant period (critical speed) and the phase difference between displacement and out-of-balance mass changes from 0° at very low speeds to 90° at the critical speed and tends towards 180° at high speeds, the quickness of the phase change being dependent on the suspension system damping.

The water surface in a partially filled balance ring is equidistant from the centre of rotation and therefore there is more water at the point of maximum displacement. When the phase difference is near 180° the out-of-balance force is diametrically opposite the bulk of the water and therefore counteracted. This effect minimises displacement (but does not reduce it to zero).

It will be seen that by the foregoing composite construction at least in the preferred form a drum or tub for a clothes washing machine is provided which enables the construction to be formed in a composite manner having at least the advantage of a plastics liner with resulting economy compared with a baked enamel product while yet having adequate strength due to the mechanical strength of the outer member and the hub and associated arms.

In addition it will be apparent that the balance ring construction has considerable advantages.

1. Because the construction comprises simple moulding and a cheap material to provide the baffling i.e. the interconnected cells, the construction is relatively cheap.

2. Because the construction is a moulding it has a satisfactory appearance and can be quickly and readily fitted to the bowl.

3. Since the liquid and foamed plastics material can be completely enclosed during manufacture little or no maintenance is likely to

be required during the life of the machine to which the balance ring is fitted.

Claims

1. A rotatable bowl or tub for spin drying clothes washing machine or the like comprising a hub, a plurality of arms or spokes radiating from said hub, a cylindrical or substantially cylindrical outer member; mounting means whereby said outer member is fixed to said arms or spokes and a liner, for example, of a plastics material mounted within said outer member and supported by said outer member and said arms or spokes.

2. A bowl as claimed in Claim 1 wherein said outer member is of a sheet material formed to a cylindrical or substantially cylindrical form with the ends of the sheets joined by welding, lock seaming or being otherwise fastened together.

3. A bowl as claimed in Claim 2 wherein said outer member is perforated with apertures surmounting outwardly extending dimples.

4. A bowl as claimed in any one of the preceding claims wherein said mounting means comprise apertures in said outer member and said arms or spokes and rivets or the like fastening members having parts thereof passing through said apertures and parts thereof holding the outer member and the spokes to each other.

5. A bowl as claimed in any one of the preceding claims wherein means are provided for reducing imbalance in said bowl said means comprising at least one hollow annular passageway mounted on the bowl substantially concentric with a resiliently mounted axis on which the bowl rotates said hollow annular passageway having a cellular plastics material therein having a plurality of interconnected cells and being partially filled with a liquid, the construction and arrangement being such that in use said liquid is caused by the forces resulting from rotation of the bowl above its critical speed to take up positions which reduce the imbalance due to unbalanced weights of clothes within said bowl.

6. A bowl as claimed in Claim 5 wherein said plastics material comprises an open cell polyester material.

7. A bowl as claimed in Claim 5 or Claim 6 wherein said annular hollow member comprises a plastics member having an annular open mouthed slot which is fitted in use over the upper edge of said outer member.

8. A bowl as claimed in Claim 7 wherein said annular hollow member is made in two parts

55 welded or otherwise fixed together.

9. A bowl as claimed in any one of Claims 5 to 8 wherein a plurality of said hollow annular passageways are provided.

10. A rotatable bowl when constructed, arranged and operable substantially as herein described with reference to and as illustrated in the accompanying drawings.

11. A method of reducing imbalance in a resiliently mounted rotatable bowl or tub for a spin drying clothes washing machine or the like said method using a resiliently mounted bowl having an annular passageway concentric with the axis on which the body is rotating, said hollow concentric body having a plurality of interconnected cells therein and said passageway being partially filled with a liquid said method comprising the steps of rotating said body at a speed above its critical speed and permitting interchange of liquid between said interconnected cells in a manner such that imbalance of the rotating body is reduced by displacement of the liquid to positions which tend to counteract the imbalance produced by the positions of other weights in the rotating body.

12. A method of reducing imbalance in a rotatable resiliently mounted bowl or tub for a spin drying clothes washing machine or the like when effected substantially as herein described with reference to and as illustrated by the accompanying drawings.

13. Means for reducing imbalance in a rotatable resiliently mounted bowl or tub for a spin drying clothes washing machine or the like said means comprising an annular passageway mounted on the bowl in use substantially concentric with the axis on which the bowl rotates said hollow annular passageway having a plurality of interconnected cells therein and being partially filled with a liquid, the construction and arrangement being such that in use on mounting said means on a resiliently mounted bowl or tub for a spin drying clothes washing machine or the like containing weights which are unbalanced said liquid is caused by the forces resulting from rotation of the bowl above its critical speed to take up positions which reduce the imbalance due to the aforesaid unbalanced weights.

14. Means for reducing imbalance in a rotatable resiliently mounted bowl or tub for a spin drying clothes washing machine or the like when constructed, arranged and operable substantially as described with reference to and as illustrated by the accompanying drawings.